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Kevin Faulkner

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SUN MICROSYSTEMS

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EXAMINER

HOSSAIN, TANIM M

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/787,322	Applicant(s) FAULKNER ET AL.	
	Examiner Tanim Hossain	Art Unit 2445	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chandrasekaran (U.S. 6,948,044) in view of Kim (U.S. 6,718,436).

As per claim 1, Chandrasekaran teaches a system for dynamically configuring a virtual volume associated with a host system, comprising: a set of storage devices, each of which includes physical block addresses for storing data associated with the virtual volume (column 3, lines 8-66); and a network switch system connecting the host system and the set of storage devices, and including: a set of storage processors each maintaining virtual volume objects comprising first tier objects reflecting a relationship between the physical block addresses and one or more logical partitions of virtual volume data, and second tier objects reflecting a logical configuration of the virtual volume (column 4, lines 1-56; column 1, line 52 – column 2, line 6; column 3, lines 26-27). Chandrasekaran uses the virtual volume objects to manage the virtual volume (column 4, lines 1-56; column 5, line 29 – column 6, line 16; column 6, line 36-39; column 6, line 62 – column 7, line 9), but does per se teach that they are used to update the volume during runtime, where the first tier objects have logical connections to both local second

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tier objects associated with a shared storage processor and to remote second tier objects associated with at least another storage processor. Kim teaches the use of different tiers of virtual volume objects used to update the virtual volume during runtime, where the first tier objects have logical connections to both local second tier objects associated with a shared storage processor and to remote second tier objects associated with at least another storage processor (Abstract; Figures 4-7, 11; column 4, lines 7-54; column 7, lines 7-24). It would have been obvious to per se disclose the specific connectedness of the tier objects to dynamically configure the virtual volume, as taught by Kim in the system of Chandrasekaran. The motivation for doing so lies in the fact that these objects necessarily must interact with each other (and must thus have connections) for them to be used in the configuration process. For example, the system must be aware of block addresses and current configurations to be able to make updates properly. Further, both inventions are from the same field of endeavor, namely the updating of virtual volumes.

As per claim 2, Chandrasekaran-Kim teaches the system of claim 1, wherein the network switch system dynamically updates the virtual volume based on a host system request (Chandrasekaran: column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 3, Chandrasekaran-Kim teaches the system of claim 1, wherein the network switch system dynamically updates the virtual volume by at least one of adding a virtual volume object to a storage processor, removing a virtual volume object from a storage processor, and moving a virtual volume object from one storage processor to another storage processor (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

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As per claim 4, Chandrasekaran-Kim teaches the system of claim 1, wherein storage processors having a first tier object are connected to a storage device storing virtual volume data and storage processors having a second tier object are connected to the host system (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 5, Chandrasekaran-Kim teaches the system of claim 1, wherein the network switch system includes a Virtualization Block Manager (VBM) component that, based on a host system request, restructures a logical tree reflecting relationships between the second tier and first tier objects of the virtual volume (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 6, Chandrasekaran-Kim teaches the system of claim 5, wherein the network switch system further includes a Virtualization Coherency Manager (VCM) that assigns the first tier objects to selective ones of the storage processors and the second tier objects to selective ones of the second tier storage processors based on the restructured logical tree (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 7, Chandrasekaran-Kim teaches the system of claim 5, wherein when the host system request requires the VBM component to add a new second tier object to a target storage processor maintaining a first tier object, the VBM component configures the new second tier object to include a Local Reference Node (LRN) that references the first tier object (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

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As per claim 8, Chandrasekaran-Kim teaches the system of claim 7, wherein the VBM component configures the second tier object to include a Remote Reference Node (RRN) that references another first tier object maintained by a storage processor different from the target storage processor (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 9, Chandrasekaran-Kim teaches the system of claim 5, wherein when the host system request requires the VBM component to add a new first tier object to a target storage processor maintaining a second tier object, the VBM component configures the second tier object to include a Local Reference Node (LRN) that references the new first tier object (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 10, Chandrasekaran-Kim teaches the system of claim 5, wherein when the host system request requires the VBM component to add to a target storage processor a new first tier object that is logically related to a second tier object maintained in a different storage processor, the VBM component configures the second tier object to include a Remote Reference Node (RRN) that references the new first tier object (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 11, Chandrasekaran-Kim teaches the system of claim 6, wherein when the host system request requires the VBM component to remove an existing second tier object tree from a target storage processor, the VCM deletes all second tier objects in the second tier tree before deleting any first tier objects that are solely referenced by the removed second tier object

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tree (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 12, Chandrasekaran-Kim teaches the system of claim 11, wherein the target storage processor maintains an existing first tier object referenced by the existing second tier object tree and by a remote second tier object maintained by a remote storage processor, and wherein the VCM maintains the existing first tier object when deleting the existing second tier object (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 13, Chandrasekaran-Kim teaches the system of claim 6, wherein when the host system request requires the VBM component to remove an existing first tier object from a target storage processor, the VCM deletes all references to the existing first tier object from any second tier objects (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 14, Chandrasekaran-Kim teaches the system of claim 6, wherein when the host system request requires the VBM component to move an existing first tier object from a first storage processor to a second storage processor having a remote reference to the existing first tier object, the VCM sends a new second tier object tree to the first and second storage processors that removes any references to the existing first tier object (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 15, Chandrasekaran-Kim teaches the system of claim 14, wherein the VCM sends a new first tier object to the second storage processor that deletes the remote reference to

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the existing first tier object from the second storage processor (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 16, Chandrasekaran-Kim teaches the system of claim 15, wherein the VCM sends a copy of the existing first tier object to the second processor following deletion of the remote reference (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 17, Chandrasekaran-Kim teaches the system of claim 16, wherein the VCM sends a new second tier object tree to the second storage processor having a new local reference to the copy of the existing first tier object (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 18, Chandrasekaran-Kim teaches the system of claim 17, wherein the VCM sends the new second tier object tree to a third storage processor with a remote reference to the copy of the existing first tier object sent to the second storage processor (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 19, Chandrasekaran-Kim teaches the system of claim 2, wherein the network switch system dynamically updates the virtual volume by collecting state information from the storage processors reflecting a current view of the virtual volume and reconfiguring a logical tree reflecting a logical relationship between the virtual volume objects based on the state information and the host system request (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

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As per claim 20, Chandrasekaran-Kim teaches the system of claim 19, wherein the current view of the virtual volume includes information reflecting which storage processors maintain first tier objects and which storage processors maintain second tier objects (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 21, Chandrasekaran-Kim teaches the system of claim 1, wherein each storage processor includes a virtualization state manager (VSM) that is configured to manage a local version of the virtual volume (Chandrasekaran: Figure 9; column 1, lines 35-67; column 5, lines 3-66; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 22, Chandrasekaran-Kim teaches the system of claim 22, wherein each storage processor VSM is configured to manage any of the virtual volume objects maintained by the respective storage processor (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 23, Chandrasekaran-Kim teaches the system of claim 6, wherein a single storage processor includes a Master VSM (MVSM) that is in an active state (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 24, Chandrasekaran-Kim teaches the system of claim 23, wherein the MVSM is configured to determine which virtual volume objects are affected by the restructured logical tree (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 25, Chandrasekaran-Kim teaches the system of claim 24, wherein the VCM assigns the first and second tier objects to respective first and second tier storage processors

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based on the affected virtual volume objects determined by the MVSM (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 26, Chandrasekaran-Kim teaches the system of claim 23, wherein the network switch system designates the single storage processor as a Master Virtualization Storage Processor (MVSP) by activating the MVSM in the designated MVSP (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 27, Chandrasekaran-Kim teaches the system of claim 26, wherein non-MVSP storage processors include an MVSM that in an inactive state when the single storage processor is designated as the MVSP (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 28, Chandrasekaran-Kim teaches the system of claim 2, wherein the network switch system includes a Virtualization Coherency Manager (VCM) that updates virtual volume assignments to the storage processors based on the host system request (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

As per claim 29, Chandrasekaran-Kim teaches the system of claim 28, wherein the network switch system includes a Virtualization Block Manager (VBM) that creates the first and second tier objects based on a user request to update the virtual volume (Chandrasekaran: column 3, lines 3-66; column 4, lines 1-56; Kim: column 4, lines 7-54; column 7, lines 7-24).

Response to Arguments

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Applicant's arguments filed on April 22, 2009 have fully been considered and are respectfully traversed by the new grounds of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tanim Hossain whose telephone number is (571)272-3881. The examiner can normally be reached on 8:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivek Srivastava can be reached on 571/272-7304. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Tanim Hossain
Patent Examiner
Art Unit 2445

/VIVEK SRIVASTAVA/

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Supervisory Patent Examiner, Art Unit 2445